

ENVIRONMENTAL

RADIATION

DATA

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Office of Radiation and Indoor Air

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Preface

Environmental Radiation Data (ERD) is compiled and published quarterly by the Office of Radiation and Indoor Air's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama, and contains data from the Environmental Radiation Ambient Monitoring System (ERAMS). ERD is published in both hard-copy and electronic formats. Electronic reports are available online at www.epa.gov/narel.

The United States Environmental Protection Agency established ERAMS in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. ERAMS is comprised of a nationwide network of sampling stations that provide air, precipitation, surface water, drinking water, and milk samples.

Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta analyses, gamma analyses, and radionuclide-specific analyses for uranium, plutonium, strontium, iodine, radium, and tritium. This monitoring effort also provides ancillary information on natural background levels and on routine and accidental releases into the environment from stationary sources.

The radiochemical procedures used by NAREL to analyze the ERAMS samples are contained in the *Eastern Environmental Radiation Facility Radiochemistry Procedures Manual* (EPA 520/5-84-006). Station operation and sample collection are in accordance with procedures contained in the *ERAMS Manual* (EPA 520/5-84-007, 008, 009).

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Acknowledgments

All sampling for the Environmental Radiation Ambient Monitoring System (ERAMS) is performed by volunteer collectors who are frequently members of the health departments or related environmental agencies of their respective states. The National Air and Radiation Environmental Laboratory (NAREL) on behalf of the U.S. Environmental Protection Agency would like to acknowledge the time and effort of these volunteer collectors, who are so essential to the successful operation of ERAMS. The efforts of the sample collectors are especially appreciated during times of emergency operation when sampling frequencies are increased and schedules are sometimes demanding.

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Data Reporting Conventions

Every laboratory measurement involves uncertainty. When there is little or no radioactivity in a sample, one consequence of measurement uncertainty is the possibility of obtaining a measured value that is less than zero. Such a negative result occurs when random effects in the measurement process cause the measured value for the sample to be less than that of the blank or background, which is subtracted from it. From April 1991 to December 1995, negative results were reported as “not detected” or “ND,” and gamma analysis results that were less than their estimated measurement uncertainties were also reported as “ND.” In January 1996 both of these practices were discontinued. Although negative activities are physically impossible, the inclusion of negative results in the report allows better statistical analysis of the data.

Results of gamma analyses are still reported as “ND” when gamma-emitting radionuclides are not detected.

Measurement Uncertainty

Each measured value y is reported with an expanded uncertainty $U = k u_c(y)$, which is determined from the combined standard uncertainty $u_c(y)$ and the coverage factor $k = 2$. The interval from $y - U$ to $y + U$ is estimated to have a level of confidence of approximately 95%.

Significant Figures

Expanded uncertainties are reported to two significant figures. Measurement results are rounded to the corresponding number of decimal places.

Detection Capability

The minimum detectable concentrations (MDCs) for each radionuclide are shown in Table 1. The MDC is defined as the minimum concentration that gives a 95% probability of detection when the detection criteria are chosen to give only a 5% probability of false detection in a blank sample.

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Table 1
Reporting Units and Minimum Detectable Concentrations
for Radionuclide Analyses

Radionuclide	Media	Reporting Unit	Minimum Detectable Concentration
Gross Alpha	Water	pCi/L	2
Gross Beta	Air	pCi/m ³	0.0015
	Water	pCi/L	2
	Precipitation	pCi/L	2
Tritium	Water	pCi/L	150
	Milk	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m ³	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m ³	0.75
	Water	pCi/L	0.1
Radium-226	Water	pCi/L	0.02
Strontium-90	Milk	pCi/L	2
	Water	pCi/L	1
‡ Iodine-131	Milk (gamma)	pCi/L	4
	Water (gamma)	pCi/L	4
	Water	pCi/L	0.3
Cesium-137	Milk	pCi/L	5
	Water	pCi/L	5
‡ Barium-140	Milk	pCi/L	15
	Water	pCi/L	15
Potassium	Milk	g/L	0.06
	Water	g/L	0.06
Potassium-40	Water	pCi/L	50

* The MDC for air is based on an assumed total sample volume of 120,000 m³. Measurement by alpha spectrometry includes combined activities of ²³⁹Pu and ²⁴⁰Pu, since the relative contributions of these two isotopes cannot be determined.

† The MDC for air is based on an assumed total sample volume of 120,000 m³.

‡ Activity as of the day of counting.

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1. Air Program

Airborne Particulates and Precipitation

Gross beta radioactivity measurements and certain specific analyses are performed on air particulates and precipitation samples as indicator measurements in assessing the general (national) impact of all contributing sources on environmental levels of radiation.

Airborne particulates are collected continuously at field stations representing wide geographic coverage, including present and potential sources of environmental radioactivity. Sampling sites are located throughout the United States.

Filters (10-cm diameter synthetic fiber) from air samplers are changed twice weekly and field measurements are made with a G-M survey meter at 5 hours after collection to allow for decay of natural radon isotopes and their progeny. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found.

The filters are sent to NAREL for more sensitive analyses in a low background beta counter. Gamma scans are performed on all filters showing gross beta counts greater than 1 pCi/m³. The laboratory obtained values are usually lower than the field estimates due to the decay of naturally occurring radionuclides between the times of the two measurements.

Precipitation samples are collected at most field stations collecting air filters. These samples are also sent to NAREL where they are composited monthly for gamma scans, tritium, and gross beta activity measurements.

A compilation of individual measurements is available from the National Air and Radiation Environmental Laboratory, 540 South Morris Avenue, Montgomery, AL 36115-2601.

Table 2
Gross Beta in Airborne Particulates
July 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Fairbanks	2	0.0	0.0	0.0	0.007	0.002	0.004
AL: Montgomery	9	0.2	0.0	0.1	0.033	0.010	0.019
AR: Little Rock	9	0.3	0.0	0.1	0.015	0.008	0.012
AZ: Phoenix	4	0.4	0.2	0.3	0.028	0.006	0.015
CA: Berkeley	9	0.1	0.0	0.0	0.005	0.001	0.003
CA: Los Angeles	9	0.1	0.0	0.1	0.009	0.006	0.007
CO: Denver	9	0.7	0.1	0.5	0.010	0.007	0.009
CT: Hartford	9	0.2	0.0	0.1	0.016	0.004	0.008
DE: Wilmington	9	0.4	0.0	0.2	0.015	0.005	0.011
FL: Jacksonville	9	0.2	0.0	0.1	0.012	0.006	0.008
FL: Miami	4	0.0	0.0	0.0	0.017	0.007	0.010
HI: Honolulu	7	0.1	0.1	0.1	0.002	0.001	0.001
IA: Iowa City	9	1.1	0.2	0.5	0.015	0.005	0.010
ID: Boise	9	1.0	0.1	0.4	0.013	0.005	0.008
ID: Idaho Falls	9				0.011	0.006	0.008
IN: Indianapolis	9	1.4	0.1	0.5	0.015	0.006	0.010
KS: Topeka	9	2.1	0.3	1.2	0.017	0.005	0.011
ME: Augusta	9	0.3	0.1	0.1	0.018	0.003	0.008
MI: Lansing	9	0.4	0.1	0.2	0.014	0.004	0.009
MN: Minneapolis	4	0.2	0.1	0.2	0.013	0.009	0.011
MN: Welch/511	1	0.1	0.1	0.1	0.007	0.007	0.007
MS: Jackson	9	0.5	0.2	0.3	0.027	0.004	0.014
NC: Charlotte	5	0.1	0.0	0.0	0.017	0.004	0.011
ND: Bismarck	6	1.0	0.1	0.4	0.011	0.005	0.007
NH: Concord	9	0.5	0.1	0.2	0.022	0.004	0.009
NV: Las Vegas	9	0.2	0.1	0.1	0.013	0.006	0.008
NY: Albany	4	0.1	0.0	0.1	0.018	0.006	0.012
NY: New York City	9	0.2	0.0	0.1	0.015	0.005	0.010
NY: Yaphank	9	0.2	0.0	0.1	0.014	0.004	0.009
OH: Painesville	9	0.6	0.1	0.3	0.021	0.005	0.011
OH: Ross	8				0.017	0.007	0.012
OR: Portland	7	0.1	0.0	0.1	0.004	0.002	0.003
PA: Harrisburg	9	0.8	0.2	0.4	0.019	0.006	0.011
PA: Pittsburgh	9	0.4	0.1	0.3	0.024	0.007	0.011
SC: Barnwell	1	0.0	0.0	0.0	0.006	0.006	0.006
SC: Columbia	8	0.6	0.1	0.3	0.020	0.005	0.013
SD: Pierre	5	0.2	0.0	0.1	0.012	0.005	0.007
TN: Knoxville	8	0.6	0.1	0.4	0.026	0.007	0.016

Table 2 (continued)
Gross Beta in Airborne Particulates
July 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Nashville	9	0.3	0.1	0.2	0.017	0.011	0.014
TN: Oak Ridge/Bethel	9	0.7	0.1	0.4	0.014	0.007	0.010
TN: Oak Ridge/K25	9	0.8	0.1	0.5	0.015	0.007	0.010
TN: Oak Ridge/Melton	9	1.0	0.2	0.5	0.015	0.007	0.011
TN: Oak Ridge/Y12 E	9	0.8	0.1	0.4	0.019	0.006	0.011
TN: Oak Ridge/Y12 W	9	0.5	0.1	0.2	0.016	0.007	0.010
TX: Austin	9	0.2	0.1	0.1	0.014	0.004	0.009
TX: El Paso	8	0.8	0.1	0.5	0.010	0.008	0.009
UT: Salt Lake City	5	0.5	0.0	0.2	0.016	0.008	0.011
VA: Lynchburg	9	0.9	0.4	0.7	0.015	0.006	0.010
WA: Olympia	3				0.004	0.002	0.003
WA: Spokane	9	0.3	0.1	0.2	0.011	0.002	0.006
WI: Madison	8	0.9	0.2	0.3	0.020	0.007	0.011

Table 3
Gross Beta in Airborne Particulates
August 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Montgomery	12	0.3	0.0	0.2	0.047	0.005	0.027
AR: Little Rock	9	0.3	0.0	0.1	0.027	0.006	0.015
AZ: Phoenix	5	0.4	0.0	0.2	0.012	0.008	0.010
CA: Berkeley	9	0.1	0.0	0.1	0.004	0.002	0.003
CA: Los Angeles	9	0.1	0.0	0.1	0.011	0.005	0.007
CO: Denver	9	0.6	0.1	0.3	0.013	0.005	0.008
CT: Hartford	9	0.2	0.0	0.1	0.011	0.004	0.007
DE: Wilmington	9	0.3	0.1	0.2	0.016	0.005	0.011
FL: Jacksonville	9	0.1	0.0	0.1	0.017	0.003	0.009
FL: Miami	4	0.1	0.0	0.0	0.008	0.002	0.005
HI: Honolulu	6	0.1	0.0	0.1	0.003	0.002	0.002
IA: Iowa City	9	1.1	0.1	0.3	0.020	0.006	0.012
ID: Boise	9	1.1	0.3	0.5	0.013	0.006	0.010
ID: Idaho Falls	9				0.011	0.006	0.008
IN: Indianapolis	9	0.6	0.0	0.3	0.015	0.006	0.009
KS: Topeka	9	3.8	0.5	1.3	0.030	0.008	0.016
ME: Augusta	8	0.5	0.0	0.2	0.013	0.004	0.008
MI: Lansing	9	0.3	0.1	0.2	0.013	0.005	0.008
MN: Minneapolis	5	0.2	0.1	0.2	0.017	0.010	0.013
MS: Jackson	9	0.7	0.2	0.4	0.046	0.010	0.019
NC: Charlotte	6	0.3	0.1	0.1	0.023	0.006	0.016
ND: Bismarck	5	1.8	0.1	0.9	0.014	0.007	0.011
NH: Concord	9	0.3	0.1	0.2	0.013	0.005	0.009
NV: Las Vegas	9	0.2	0.1	0.1	0.011	0.003	0.009
NY: Albany	3	0.4	0.1	0.2	0.012	0.008	0.010
NY: New York City	8	0.1	0.0	0.1	0.015	0.005	0.009
NY: Yaphank	9	0.4	0.0	0.1	0.013	0.004	0.008
OH: Painesville	7	0.4	0.1	0.2	0.012	0.006	0.009
OH: Ross	9				0.018	0.009	0.013
OR: Portland	5	0.2	0.1	0.1	0.005	0.002	0.004
PA: Harrisburg	9	0.5	0.1	0.3	0.015	0.006	0.010
PA: Pittsburgh	9				0.013	0.007	0.011
SC: Barnwell	2	0.0	0.0	0.0	0.011	0.007	0.009
SC: Columbia	8	0.4	0.1	0.2	0.024	0.010	0.015
SD: Pierre	6	0.4	0.1	0.2	0.013	0.005	0.008
TN: Knoxville	9	1.3	0.3	0.7	0.032	0.017	0.023
TN: Nashville	7	0.5	0.1	0.3	0.033	0.009	0.017
TN: Oak Ridge/Bethel	9	0.9	0.4	0.7	0.020	0.010	0.015

Table 3 (continued)
Gross Beta in Airborne Particulates
August 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Oak Ridge/K25	9	1.4	0.5	0.9	0.019	0.011	0.015
TN: Oak Ridge/Melton	9	1.5	0.6	0.9	0.019	0.010	0.015
TN: Oak Ridge/Y12 E	9	1.5	0.3	0.8	0.021	0.012	0.016
TN: Oak Ridge/Y12 W	9	0.9	0.3	0.5	0.020	0.011	0.016
TX: Austin	9	0.2	0.1	0.2	0.021	0.004	0.010
TX: El Paso	9	0.5	0.0	0.2	0.017	0.009	0.012
UT: Salt Lake City	3	0.2	0.0	0.1	0.012	0.010	0.012
VA: Lynchburg	8	1.1	0.4	0.7	0.016	0.007	0.013
WA: Olympia	7				0.005	0.002	0.003
WA: Spokane	9	0.2	0.1	0.2	0.011	0.005	0.008
WI: Madison	9	0.6	0.1	0.3	0.023	0.005	0.011

Table 4
Gross Beta in Airborne Particulates
September 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Fairbanks	2	0.0	0.0	0.0	0.005	0.003	0.004
AL: Montgomery	18	0.3	0.0	0.1	0.038	0.003	0.018
AR: Little Rock	8	0.4	0.0	0.1	0.022	0.009	0.015
AZ: Phoenix	4	0.9	0.4	0.6	0.015	0.006	0.012
CA: Berkeley	8	0.2	0.0	0.1	0.012	0.004	0.009
CA: Los Angeles	8	0.1	0.0	0.1	0.017	0.008	0.012
CO: Denver	9	1.2	0.4	0.7	0.016	0.007	0.010
CT: Hartford	8	0.2	0.0	0.1	0.009	0.004	0.007
DE: Wilmington	9	0.4	0.0	0.1	0.021	0.005	0.011
FL: Jacksonville	7	0.1	0.0	0.1	0.009	0.006	0.008
FL: Miami	2	0.0	0.0	0.0	0.009	0.004	0.007
HI: Honolulu	9	0.2	0.1	0.1	0.005	0.003	0.004
IA: Iowa City	9	1.1	0.1	0.5	0.017	0.005	0.011
ID: Boise	7	0.8	0.3	0.6	0.017	0.005	0.011
ID: Idaho Falls	9				0.017	0.007	0.010
IN: Indianapolis	8	0.9	0.1	0.4	0.017	0.007	0.010
KS: Topeka	9	4.1	0.4	1.5	0.026	0.009	0.014
ME: Augusta	8	0.5	0.0	0.1	0.009	0.005	0.007
MI: Lansing	9	0.7	0.1	0.3	0.011	0.004	0.008
MN: Minneapolis	4	0.2	0.1	0.2	0.016	0.009	0.012
MS: Jackson	8	0.6	0.2	0.3	0.027	0.008	0.014
NC: Charlotte	6	0.4	0.1	0.2	0.014	0.007	0.010
ND: Bismarck	4	0.6	0.3	0.5	0.012	0.007	0.008
NH: Concord	8	0.3	0.0	0.2	0.013	0.005	0.008
NV: Las Vegas	8	0.2	0.1	0.1	0.014	0.002	0.010
NY: Albany	5	0.1	0.0	0.1	0.014	0.008	0.012
NY: New York	1	0.0	0.0	0.0	0.011	0.011	0.011
NY: New York City	7	0.1	0.0	0.0	0.016	0.005	0.009
NY: Syracuse	3				0.014	0.010	0.012
NY: Yaphank	9	0.2	0.0	0.1	0.013	0.004	0.008
OH: Painesville	7	0.5	0.1	0.2	0.022	0.005	0.012
OH: Ross	8				0.022	0.009	0.014
OR: Portland	8	0.2	0.1	0.1	0.011	0.003	0.006
PA: Harrisburg	9	0.6	0.1	0.3	0.017	0.007	0.011
PA: Pittsburgh	8				0.019	0.005	0.013
SC: Barnwell	2	0.0	0.0	0.0	0.011	0.004	0.007
SC: Columbia	6	0.5	0.1	0.2	0.016	0.006	0.011
SD: Pierre	4	0.1	0.0	0.1	0.021	0.007	0.012

Table 4 (continued)
Gross Beta in Airborne Particulates
September 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Knoxville	8	1.7	0.3	0.9	0.037	0.008	0.018
TN: Oak Ridge/Bethel	9	1.6	0.1	0.6	0.017	0.005	0.014
TN: Oak Ridge/K25	9	1.8	0.3	0.9	0.018	0.006	0.014
TN: Oak Ridge/Melton	9	1.8	0.1	0.8	0.017	0.006	0.013
TN: Oak Ridge/Y12 E	9	1.9	0.3	0.9	0.020	0.005	0.014
TN: Oak Ridge/Y12 W	9	0.9	0.1	0.4	0.017	0.006	0.014
TX: Austin	8	0.2	0.1	0.2	0.021	0.008	0.013
TX: El Paso	8	1.0	0.6	0.7	0.018	0.010	0.014
UT: Salt Lake City	2	0.1	0.0	0.0	0.044	0.022	0.029
VA: Lynchburg	8	1.0	0.1	0.5	0.016	0.003	0.009
WA: Spokane	9	0.5	0.1	0.3	0.018	0.003	0.009
WI: Madison	8	0.6	0.1	0.3	0.018	0.004	0.009

Table 5
Gross Beta and Specific Gamma in Precipitation
July 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L	± 2 <u><i>u</i></u>	Nuclide	pCi/L ± 2 <u><i>u</i></u>
AL: Montgomery	2.12	0.36	Be7	56 38
			Pb212	5.0 6.7
AR: Little Rock	0.71	0.27		ND
AZ: Phoenix	1.98	0.36		ND
CO: Denver	1.28	0.31	Be7	49 30
CT: Hartford	4.19	0.47	Be7	59 38
DE: Wilmington	2.22	0.38	Be7	45 32
FL: Jacksonville	1.43	0.32		ND
FL: Miami	0.24	0.22	Pb212	3.8 7.0
HI: Honolulu	1.95	0.36	K40	14 28
IA: Iowa City	0.58	0.27		ND
ID: Idaho Falls	3.55	0.45	Be7	40 28
ME: Augusta	3.62	0.44	Be7	63 41
MI: Lansing	0.89	0.28	K40	37 55
			Tl208	3.0 2.7
MN: Minneapolis	0.97	0.29		ND
MN: Welch	3.15	0.45		ND
NC: Charlotte	3.84	0.45	Be7	60 28
			Pb212	4.3 6.8
NC: Wilmington	2.50	0.39	Be7	61 20
ND: Bismarck	0.91	0.29		ND
NH: Concord	1.68	0.34		ND
NM: Santa Fe	1.38	0.36		ND
NV: Las Vegas	4.16	0.48		ND
NY: Albany	1.29	0.32	Be7	21 23
NY: Yaphank	8.38	0.64	Be7	29 22
OH: Painesville	1.59	0.34	Be7	37 29
			Tl208	2.3 3.4
PA: Harrisburg	2.99	0.41	Be7	34 27
SC: Barnwell	1.03	0.30		ND
SC: Columbia	0.80	0.27		ND
TN: Knoxville	1.29	0.31	Be7	49 26
TN: Nashville	1.47	0.32	Be7	47 26
TX: Austin	0.55	0.25		ND
TX: El Paso	1.27	0.31		ND
UT: Salt Lake City	8.71	0.68	Be7	86 24
			K40	36 26

Note: ND = Not Detected

Table 5 (continued)
Gross Beta and Specific Gamma in Precipitation
July 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L ± 2u	Nuclide	pCi/L ± 2u	
VA: Lynchburg	17.25	0.91	K40	46 69
WA: Olympia	0.66	0.26		ND
WI: Madison	1.08	0.30	K40	26 41

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
August 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L	± 2u	Nuclide	pCi/L ± 2u
AL: Montgomery	3.58	0.44	Be7	62 17
AZ: Phoenix	0.98	0.33		ND
CO: Denver	1.41	0.31		ND
CT: Hartford	3.20	0.42	Be7	79 39
DE: Wilmington	1.43	0.32		ND
FL: Jacksonville	1.57	0.34	Be7	44 20
			Tl208	1.7 1.5
FL: Miami	0.77	0.33	Be7	18 15
			Pb212	3.2 3.0
HI: Honolulu	1.49	0.39	Pb212	7.6 8.4
	2.58	0.40		ND
IA: Iowa City	0.98	0.29	Be7	34 17
			Pb212	2.9 3.2
ID: Boise	4.34	0.51	K40	29 42
			Pb212	5.3 5.7
ME: Augusta	3.71	0.44	Be7	91 38
MI: Lansing	1.26	0.31	K40	34 35
MN: Minneapolis	1.08	0.29	K40	9 14
MN: Welch	2.55	0.42	Tl208	2.2 3.7
NC: Charlotte	4.41	0.48	Be7	61 25
NC: Wilmington	3.69	0.45	Be7	68 28
ND: Bismarck	0.72	0.28		ND
NH: Concord	2.32	0.38	Be7	36 30
			Tl208	3.7 3.8
NM: Santa Fe	1.30	0.32	Be7	40 35
			Pb212	4.2 6.4
			Tl208	2.3 4.3
NY: Albany	1.23	0.30	K40	21 37
NY: Yaphank	2.66	0.39		ND
OH: Painesville	2.28	0.37	Be7	55 32
			Pb212	5.2 6.2
			Tl208	3.4 3.7
PA: Harrisburg	2.45	0.38	Be7	29 28
SC: Barnwell	4.59	0.49	Be7	86 33
			Tl208	3.0 3.7
SC: Columbia	1.82	0.35	Be7	31 26
TN: Knoxville	1.11	0.30	Tl208	3.8 3.6

Note: ND = Not Detected

Table 6 (continued)
Gross Beta and Specific Gamma in Precipitation
August 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L ± 2u	Nuclide	pCi/L ± 2u	
TN: Nashville	2.10	0.37	Be7	33 16
TX: El Paso	0.59	0.26	Pb212	4.4 4.0
VA: Lynchburg	6.28	0.57		ND
WA: Olympia	1.47	0.39		ND
WI: Madison	1.18	0.30		ND

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
September 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L	± 2 <u>a</u>	Nuclide	pCi/L ± 2 <u>a</u>
AL: Montgomery	4.17	0.46		ND
AR: Little Rock	3.68	0.45	Be7	37 39
AZ: Phoenix	1.27	0.31		ND
CO: Denver	5.57	0.54	Pb212	4.5 6.8
CT: Hartford	0.33	0.25	Be7	58 43
DE: Wilmington	1.25	0.30		ND
FL: Jacksonville	1.09	0.30	Tl208	2.0 3.4
FL: Miami	0.82	0.28		ND
IA: Iowa City	1.52	0.34		ND
ID: Idaho Falls	4.47	0.48		ND
ME: Augusta	0.72	0.27		ND
MI: Lansing	4.81	0.53	Pb212	4.7 4.9
MN: Minneapolis	3.13	0.42	Be7	51 42
NC: Charlotte	1.42	0.32		ND
NC: Wilmington	0.65	0.28	K40	14 28
ND: Bismarck	0.67	0.26		ND
NH: Concord	1.96	0.36	K40	30 49
NM: Santa Fe	1.76	0.35	K40	26 34
NY: Albany	0.95	0.30	Be7	48 40
			Pb212	4.8 5.5
			Tl208	2.6 3.4
NY: Syracuse	0.79	0.28		ND
NY: Yaphank	2.42	0.38		ND
OH: Painesville	2.00	0.35		ND
PA: Harrisburg	1.17	0.31		ND
SC: Barnwell	4.02	0.46	Be7	54 48
SC: Columbia	1.22	0.30		ND
UT: Salt Lake City	8.33	0.65		ND
VA: Lynchburg	7.18	0.60		ND
WI: Madison	1.21	0.31	K40	37 42

Note: ND = Not Detected

Table 8
Tritium in Precipitation
July - September 1999

Location	July 1999		August 1999		September 1999	
	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$	pCi/L	$\pm 2\sigma$
AL: Montgomery	-24	75	-20	76	-34	79
AR: Little Rock	2	76	NS		-20	81
AZ: Phoenix	-29	75	0	75	-50	78
CO: Denver	-32	75	9	77	7	83
CT: Hartford	42	78	21	81	-8	81
DE: Wilmington	19	77	-15	80	20	81
FL: Jacksonville	-24	75	-36	80	3	80
FL: Miami	19	76	-53	77	-10	80
HI: Honolulu	-23	79	-21	75	NS	
IA: Iowa City	-12	76	-4	75	-18	82
ID: Boise	NS		28	78	NS	
ID: Idaho Falls	16	80	NS		7	82
ME: Augusta	-6	75	-5	80	-59	78
MI: Lansing	-19	75	23	77	41	82
MN: Minneapolis	-27	75	56	78	-3	83
MN: Welch	-31	75	-25	75	NS	
NC: Charlotte	41	76	52	82	18	81
NC: Wilmington	41	77	-37	78	-38	79
ND: Bismarck	-13	75	-32	75	54	86
NH: Concord	57	78	-20	79	5	81
NM: Santa Fe	-12	75	18	77	12	83
NV: Las Vegas	-43	79	NS		NS	
NY: Albany	17	77	32	80	60	84
NY: Syracuse	NS		NS		18	80
NY: Yaphank	47	78	-24	79	-51	79
OH: Painesville	-10	75	90	80	18	83
PA: Harrisburg	13	76	-8	80	-16	80
SC: Barnwell	70	79	57	79	23	80
SC: Columbia	-39	74	31	81	-10	81
TN: Knoxville	-83	72	23	77	NS	
TN: Nashville	-19	75	-5	80	NS	
TX: Austin	-10	76	NS		NS	
TX: El Paso	-78	72	-80	72	NS	
UT: Salt Lake City	-73	73	NS		38	83
VA: Lynchburg	76	80	31	81	28	82
WA: Olympia	-39	78	-3	75	NS	
WI: Madison	12	76	25	77	-23	80

Note: NS = No Sample

Plutonium and Uranium in Airborne Particulates and Precipitation

Environmental radiation levels of plutonium and uranium are determined by the analysis of annually composited samples (air filters) collected from the continuously operating airborne particulate samplers.

Concentrations of plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 are determined by alpha spectrometry following chemical separation. The volume of air represented by the annual composite ranges from 120,000 to 500,000 cubic meters.

Plutonium and uranium results are published when they become available.

2. Water Program

The ERAMS water program provides data on radionuclide concentrations in the nation's rivers, streams, and drinking water supplies.

Surface Water

In July, 1999, the collection of surface water samples, part of the ERAMS water program, was discontinued.

Drinking Water

This program monitors ambient radiation levels in drinking water in as many as 78 sites. These data serve to assess trends and anomalies in concentrations, and to compare with standards set forth in the EPA “National Interim Primary Drinking Water Regulations.” These regulations provide for approval of supplies when the combined radium-226 and radium-228 levels do not exceed 5 pCi/L, when the gross alpha (excluding radon and uranium) levels do not exceed 15 pCi/L, when tritium levels do not exceed 20,000 pCi/L, when the strontium-90 levels do not exceed 8 pCi/L, and when the gross beta levels do not exceed 50 pCi/L.

Grab samples are taken at the 78 sites which are either major population centers or selected nuclear facility environs.

The analyses include (a) tritium on a quarterly basis; (b) gross alpha, gross beta, strontium-90, and gamma on annual composites; (c) radium-226 if the gross alpha exceeds 2 pCi/L and radium-228 if the radium-226 falls between 3 and 5 pCi/L; (d) iodine-131 on one quarterly sample per year for each station; and (e) an annual composite for plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 for stations that demonstrate gross alpha levels greater than 2 pCi/L.

Table 9
Tritium in Drinking Water
July - September 1999

Location	Date Collected	³ H pCi/L ± 2u	
AK: Fairbanks	08/26/99	13	78
AL: Dothan	07/08/99	-20	76
AL: Montgomery	07/01/99	-12	73
AL: Muscle Shoals	07/01/99	97	78
AL: Scottsboro	07/02/99	91	77
AR: Little Rock	07/12/99	-5	77
CA: Berkeley	07/20/99	-16	75
CA: Los Angeles	07/13/99	14	78
CO: Denver	07/23/99	64	78
CT: Hartford	07/09/99	-11	77
DE: Dover	07/07/99	-5	77
FL: Miami	07/06/99	26	75
FL: Tampa	08/11/99	10	78
GA: Baxley	07/22/99	47	78
GA: Savannah	09/23/99	2	78
HI: Honolulu	07/28/99	38	80
ID: Idaho Falls	07/19/99	71	79
IL: W. Chicago	07/07/99	31	79
KS: Topeka	07/06/99	60	76
LA: New Orleans	07/22/99	-20	75
MA: Lawrence	07/09/99	14	78
MD: Baltimore	07/06/99	-12	73
MD: Conowingo	09/15/99	227	87
ME: Augusta	07/27/99	-28	74
MI: Detroit	07/15/99	128	83
MI: Grand Rapids	07/08/99	37	79
MN: Minneapolis	07/19/99	-11	77
MN: Red Wing	07/26/99	-9	76
MO: Jefferson City	07/06/99	61	76
MS: Jackson	07/14/99	9	79
MS: Port Gibson	07/13/99	-92	74
MT: Helena	08/06/99	20	79
NC: Charlotte	08/04/99	493	96
NC: Wilmington	07/20/99	379	90
ND: Bismarck	07/06/99	17	74
NE: Lincoln	07/07/99	19	78
NH: Concord	07/06/99	14	74
NH: Concord	09/06/99	10	81
NM: Santa Fe	07/06/99	-3	73
NV: Las Vegas	07/14/99	11	79

Table 9 (continued)
Tritium in Drinking Water
July - September 1999

Location	Date Collected	³ H pCi/L ± 2u
NY: Albany	07/07/99	-14 72
NY: Syracuse	08/02/99	43 81
OH: Cincinnati	09/01/99	2 77
OH: E. Liverpool	09/16/99	-11 77
OH: Painesville	07/07/99	54 79
OH: Toledo	07/07/99	137 79
OK: Oklahoma City	07/14/99	2 78
OR: Portland	07/13/99	-50 76
PA: Columbia	09/09/99	31 79
PA: Harrisburg	09/17/99	46 80
PA: Philadelphia - Baxter	08/06/99	131 83
PA: Philadelphia - Queen	08/06/99	17 79
PA: Pittsburgh	09/16/99	11 77
PC: Corozal	08/03/99	31 79
RI: Providence	07/12/99	14 78
SC: Barnwell	07/07/99	-86 75
SC: Columbia	07/28/99	127 81
SC: Jenkinsville	07/14/99	61 80
SC: Seneca	08/04/99	13 78
TN: Chattanooga	07/08/99	81 81
TN: Knoxville	07/05/99	34 75
TN: Oak Ridge - Anderson Co #768	09/30/99	-43 75
TN: Oak Ridge - Anderson Co #772	09/30/99	-7 77
TN: Oak Ridge - Knox Co #371	09/30/99	21 79
TN: Oak Ridge - Roane Co #360	09/30/99	-28 76
TN: Oak Ridge - Roane Co #4442	09/30/99	-14 76
TX: Austin	07/08/99	14 78
VA: Doswell	08/23/99	56 80
VA: Lynchburg	07/27/99	9 76
WA: Richland	07/15/99	-2 79
WA: Seattle	08/17/99	-7 77
WI: Genoa	07/13/99	-34 77
WI: Madison	07/07/99	14 74

3. Milk Program

Pasteurized Milk

Milk is a reliable indicator of the general population's intake of radionuclides since it is consumed fresh by a large segment of the population and can contain several of the biologically significant radionuclides that result from environmental releases from nuclear activities. A primary function of this program is to obtain reliable monitoring data relative to current radionuclide concentrations and determine any long-term trends.

Quarterly samples are collected at approximately 55 sampling sites. The samples are composited, according to production, from the major milk suppliers representing more than 80 percent of the milk consumed in a given population center.

The samples are analyzed for gamma-emitting nuclides, including iodine-131, barium-140, cesium-137, and potassium-40. Total potassium concentrations in g/L are determined from potassium-40 activities assuming natural isotopic abundances. All samples collected in July are analyzed for strontium-90.

Iodine-131, barium-140, cesium-137, and potassium-40 are determined by gamma spectral analysis. Strontium-90 is determined by beta counting a total strontium precipitate that has been chemically separated by ion exchange.

Table 10
Radionuclides in Pasteurized Milk
July - September 1999

Location	Date Collected	K g/L $\pm 2u$	¹³⁷ Cs pCi/L $\pm 2u$	¹⁴⁰ Ba pCi/L $\pm 2u$	¹³¹ I pCi/L $\pm 2u$
AL: Montgomery	07/02/99	1.64	0.10	ND	ND
AR: Little Rock	07/19/99	1.573	0.093	ND	ND
AZ: Phoenix	07/07/99	1.55	0.12	ND	ND
CA: Los Angeles	07/08/99	1.75	0.10	ND	ND
CA: Sacramento	07/21/99	1.573	0.083	ND	ND
CA: San Francisco	07/13/99	1.644	0.090	ND	ND
CZ: Panama City	09/23/99	1.680	0.091	2.5 2.3	ND
DE: Wilmington	07/06/99	1.597	0.094	ND	ND
FL: Tampa	07/12/99	1.561	0.079	ND	ND
GA: Atlanta	07/07/99	1.656	0.082	ND	ND
HI: Honolulu	07/09/99	1.585	0.089	ND	ND
IA: Des Moines	07/12/99	1.573	0.078	ND	ND
IL: Chicago	07/22/99	1.61	0.10	ND	ND
IN: Indianapolis	07/19/99	1.597	0.080	ND	ND
KS: Wichita	07/06/99	1.63	0.15	ND	ND
KY: Louisville	07/07/99	1.61	0.12	ND	ND
MA: Boston	07/05/99	1.680	0.094	ND	ND
MD: Baltimore	07/09/99	1.58	0.12	ND	ND
ME: Portland	07/22/99	1.692	0.084	ND	ND
MI: Detroit	07/13/99	1.632	0.080	ND	ND
MI: Grand Rapids	07/07/99	1.692	0.089	ND	ND
MS: Jackson	07/08/99	1.45	0.14	ND	ND
NJ: Trenton	09/02/99	1.609	0.082	ND	ND
NM: Albuquerque	07/19/99	1.45	0.14	ND	ND
NV: Las Vegas	08/03/99	1.54	0.12	ND	ND
NY: Buffalo	07/06/99	1.632	0.067	ND	ND
NY: Syracuse	07/07/99	1.66	0.11	ND	ND
OH: Cleveland	07/13/99	1.61	0.10	ND	ND
OR: Portland	07/07/99	1.609	0.093	ND	ND
PA: Philadelphia	07/07/99	1.632	0.083	ND	ND
PA: Pittsburgh	07/06/99	1.656	0.067	ND	ND
PR: San Juan	07/20/99	1.66	0.15	ND	ND
SD: Rapid City	07/09/99	1.632	0.083	ND	ND
TN: Chattanooga	07/08/99	1.47	0.14	ND	ND
TN: Knoxville	07/08/99	1.656	0.068	ND	ND
TX: Austin	08/16/99	1.454	0.088	ND	ND
TX: Ft. Worth	07/20/99	1.573	0.079	ND	ND
VA: Norfolk	08/26/99	1.58	0.15	ND	ND
VT: Burlington	07/09/99	1.668	0.067	ND	ND

Note: ND = Not Detected

Table 10 (continued)
Radionuclides in Pasteurized Milk
July - September 1999

Location	Date Collected	K g/L $\pm 2u$	^{137}Cs pCi/L $\pm 2u$	^{140}Ba pCi/L $\pm 2u$	^{131}I pCi/L $\pm 2u$
WA: Spokane	07/06/99	1.501	0.092	ND	ND
WV: Charleston	07/08/99	1.525	0.070	ND	ND

Note: ND = Not Detected

Table 11

Strontium-90 in Pasteurized Milk

July 1999

Strontium-90 results will be reported at a later date.

For More Information

Environmental Radiation Data (ERD) is published quarterly by the U.S. Environmental Protection Agency's Office of Radiation and Indoor Air.

Requests for information concerning the operation of ERAMS and the data that are generated should be directed as follows:

For System Operations-

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National Air and Radiation Environmental
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For Analytical Information and Data-

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Montgomery, Alabama 36115-2601
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Requests for information concerning publication and distribution of ERD should be directed to:

Charles M. Petko
Office of the Director
National Air and Radiation Environmental Laboratory
540 South Morris Avenue
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Requests for information concerning policies of the Office of Radiation and Indoor Air should be directed to:

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Contents

	Page
List of Tables	v
Preface	vii
Acknowledgments	ix
Data Reporting Conventions	xi
1. Air Program	1
Airborne Particulates and Precipitation	1
Plutonium and Uranium in Airborne Particulates and Precipitation	14
2. Water Program	15
Surface Water	15
Drinking Water	16
3. Milk Program	19
Pasteurized Milk	19

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List of Tables

Table	Page
1 Reporting Units and Minimum Detectable Concentrations	xiii
2 Gross Beta in Airborne Particulates: July 1999	2
3 Gross Beta in Airborne Particulates: August 1999	4
4 Gross Beta in Airborne Particulates: September 1999	6
5 Gross Beta and Specific Gamma in Precipitation: July 1999	8
6 Gross Beta and Specific Gamma in Precipitation: August 1999	10
7 Gross Beta and Specific Gamma in Precipitation: September 1999	12
8 Tritium in Precipitation: July - September 1999	13
9 Tritium in Drinking Water: July - September 1999	17
10 Radionuclides in Pasteurized Milk: July - September 1999	20
11 Strontium-90 in Pasteurized Milk: July 1999	22

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